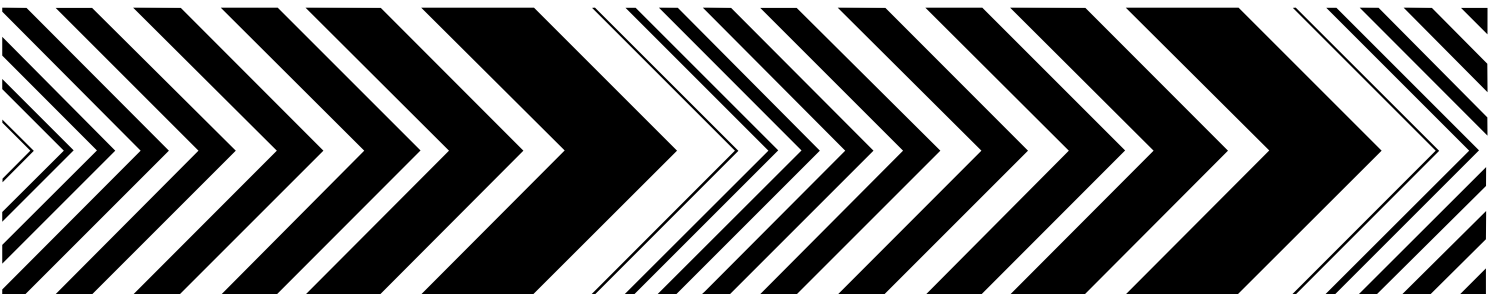




Sewer and Tank Sediment Flushing: Case Studies



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Notice

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Foreword

The U.S. Environmental Protection Agency is charged by Congress with protecting the Nation's land, air, and water resources. Under a mandate of national environmental laws, the Agency strives to formulate and implement actions leading to a compatible balance between human activities and the ability of natural systems to support and nurture life. To meet this mandate, EPA's research program is providing data and technical support for solving environmental problems today and building a science knowledge base necessary to manage our ecological resources wisely, understand how pollutants affect our health, and prevent or reduce environmental risks in the future.

The National Risk Management Research Laboratory is the Agency's center for investigation of technological and management approaches for reducing risks from threats to human health and the environment. The focus of the Laboratory's research program is on methods for the prevention and control of pollution to air, land, water and subsurface resources; protection of water quality in public water systems; remediation of contaminated sites and ground water; and prevention and control of indoor air pollution. The goal of this research effort is to catalyze development and implementation of innovative, cost-effective environmental technologies; develop scientific and engineering information needed by EPA to support regulatory and policy decisions; and provide technical support and information transfer to ensure effective implementation of environmental regulations and strategies.

This publication has been produced as part of the Laboratory's strategic long-term research plan. It is published and made available by EPA's Office of Research and Development to assist the user community and to link researchers with their clients.

E. Timothy Oppelt, Director
National Risk Management
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Abstract

Past studies have identified urban combined sewer overflow (CSO) and stormwater runoff as major contributors to the degradation of many urban lakes, streams, and rivers. Sewage solids deposited in combined sewer (CS) systems during dry weather are major contributors to the CSO-pollution load. Innovative methods for cleaning accumulated sludge and debris in CSO and stormwater conveyance systems and storage tanks have emerged over the last 15 years by creating high speed flushing waves to resuspend deposited sediments. Cleansing efficiency of periodic flush waves depends on flush volume, flush discharge rate, sewer slope, sewer length, sewer flow rate, sewer diameter and population density. Maximum flushing volumes at upstream points are limited by available space, hydraulic limitations and costs. Maximum flushing rates at the downstream point are limited by the regulator/interceptor capacities prior to overflow. The relationship between cleaning efficiency and pipe length is important. The aim of flushing is to wash the resuspended sediment to strategic locations, i.e., to a point where the waste stream is flowing with sufficient velocity, to another point where flushing will be initiated, to a storage sump which will allow later removal of the stored contents, or to the wastewater treatment plant (WWTP). This reduces the amount of solids resuspended during storm events, lessens the need for CSO treatment and sludge removal at downstream storage facilities, and allows the conveyance of more flow to the WWTP or to the drainage outlet. This report will demonstrate that sewer system and storage tank flushing that reduces sediment deposition and accumulation is of prime importance to optimizing performance, maintaining structural integrity, and minimizing pollution of receiving waters.

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Acronyms and Abbreviations

ac	Acre
aq	Aqueous
BOD	Biochemical oxygen demand
°C	Degrees Celsius
cfs	Cubic feet per second
cm	Centimeter
CS	Combined sewer
CSHG	Calcium Silicate Hydrate Gel
CSO	Combined sewer overflow
DO	Dissolved oxygen
EDP	Environmental Design & Planning, Inc.
EPA	United States Environmental Protection Agency
EXTRAN	Extended Transport Block
fps	Feet per second
ft	Feet
gpd	Gallons per day
gpm	Gallons per minute
HP(hp)	Horsepower
hr	hour
in	Inch
kPa	kiloPascals
l	Liter
lps	Liters per second
m	Meter
mg	milligram
MG	Million gallons
MGD	Million gallons per day
mm	Millimeter
N	Newton
NRMRL	National Risk Management Research Laboratory
pkwy	Parkway
POTW	Publicly Owned Treatment Works
ppm	Parts per million
psi	Pounds per square inch
QAPP	Quality Assurance Protection Plan
R&D	Research & Development
sec	second
SS	Suspended solids
SWMM	Stormwater Management Model
TF	Tipping flusher
US	United States
WWTP	Wastewater treatment plant
\$	Dollars
%	Percent
"	inch

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